Aircraft Cabin Turbulence Warning Experiment

OBJECTIVE

- ***To determine the estimated time required to configure a commercial aircraft cabin for safe transit of atmospheric turbulence.***

Approach

- Conduct series of timed aircraft cabin preparation exercises on wide-body and narrow-body aircraft
  - Utilize 747 Cabin Evacuation Facility at FAA/CAMI for the Wide Body Experiment
  - Cabin crew staff from United, US Airways, and Delta
  - Paid passenger subjects funded by NASA
  - Guidance from CAMI Cabin Evacuation Drill experience

- Use team of experienced airline operational staff to develop plans and procedures

Experiment Variables

- Cabin readiness time
- Cabin preparation procedure
- Cabin Activities
  - Food & beverage service
  - lavatory utilization
- Airline Cabin Crews

Expected Experiment Outcomes

- Provide reliable estimate for cabin readiness warning time requirement for developing turbulence warning technology
- Provide a valuable benchmark against which future developments will be measured
- Reduce passenger and crew injuries in turbulence encounters

Development of the Plan

- Locate an Actual Aircraft
- Prepare the Aircraft Interior
- Design the Experiment

In Need of an Aircraft

- Consideration for the ‘down-time’ of the Aircraft
- Installation of Video Equipment
- Availability of Resources

CAMI 747 Cabin Evacuation Facility

Methodology

Devise three scenarios to represent cabin situations that would present a challenge for all cabin occupants to expeditiously return to their seats.

Scenarios focus on situations where passengers are out of their seats and/or a meal service is underway.

Scenarios

- Bistro/Snack Pak meal conclusion - Domestic flight
- Full Meal Service - Mid-flight
- After movie - International flight

Plan Details

- Begin with an initial cabin condition
- Continue with a selected procedure
- Terminate when the cabin ready condition was achieved.

Scenario A

- Flight is a long-haul, international flight
- Exercise occurs mid-flight, following the movie
- Passenger activities include reading, sleeping, stretching, waiting for lavatory, working on computers
- Heavy Lavatory use
- Cabin Crew activities include serving water, rest breaks

Scenario A

- 5 flight attendants-represents FAA minimum crew
- 69 participants
- 3 Child restraints with ‘infants’
- 2 Lap ‘infants’
- Remaining seats occupied by ‘people boxes’

Scenario B

- Flight is a domestic business flight
- Exercise occurs approximately 30 mins before landing
- Passenger activities include eating/finishing their snack packs, waiting for the lavatory, working on the computer, reading
- Cabin Crew activities include picking up service items/snack packs, securing galleys

Scenario B

- 5 flight attendants-represents FAA minimum crew
- 68 participants
- 3 Child restraints with ‘infants’
- 1 Lap ‘infant’
- Remaining seats occupied by ‘people boxes’

Scenario C

- Flight is a domestic transcontinental flight
- Exercise occurs mid-flight during the meal service
- Passenger activities include eating their meal, reading, watching movie
- Cabin Crew activities include use of meal carts, galley activity

Scenario C

- 5 flight attendants-represents FAA minimum crew
- 68 participants
- 3 Child restraints with ‘infants’
- 1 Lap ‘infant’
- Remaining seats occupied by ‘people boxes’

Encounter Procedures

Baseline

- All serving carts and equipment stowed in assigned locations
- Personal items stowed
- All occupants belted in assigned seats.
- Included current airline procedures

Encounter Procedures

Expedited

- All occupants belted in assigned seats.
- Serving equipment is not stowed
- Standard airline practice

Subjects

- Conform to FAR 25 Appendix J
- At least 40% female
- At least 35% over 50 yrs
- At least 15% female and over 50 yrs
- Three life size dolls
- Crewmembers, mechanics, training personnel may not be used are participants

Excel Spread Sheet

- Spread Sheets created for each scenario
- Participant's vest #, personal equipment, initial position, initial activity, status of tray table and seat belt
- Cabin Crew position, equipment, initial position, initial activity, assigned jump-seat

Scenario A

AERF Ref. Seat	Pax ID/ Vest	Gender	Age	Personal Equipment	Pax Link	Tray Table	Initial Pax Position	Initial Activity	Notes; Fastened seatbelt (F) Unfastened seatbelt (UF)
5	7	F	55	NA	N/A	S	LAV1	In LAV1	N/A
6	5	M	55	NA	N/A	D	Seated	Dozing	UF
7	9	M	30	NA	N/A	D	Standing G1	Talking to F/A #2	N/A
13	8	F	40	NA	N/A	S	Standing outside LAV 1	Waiting to use LAV	N/A
14	1	F	30	Computer	N/A	D	Seated	Working on Computer	F
17	6	M	54	NA	N/A	S	LAV3	In LAV3	N/A
25	4	M	51	Book	26	S	Seated	Reading	F
36	39	F	61	NA	N/A	S	Seated	Dozing	UF
40	37	M	40	2 pillows/ blanket	N/A	S	Sleeping	Sleeping across 39-41	UF
57	29	F	30	Lap child	56	D	Seated	Playing w/ lap child	UF-will have to fasten seatbelt while holding child

Boarding Passes

Boarding Passes were created for each scenario and trial

Each participant received a boarding pass prior to each scenario and trial

Boarding Pass

Information included:

- **Seat Assignment**
- **Vest Number**
- **Personal Equipment**
- **Role**
- **Starting Position**
- **Beginning and end of the experiment**

Preparation of the Cabin Interior

Bringing it all together!


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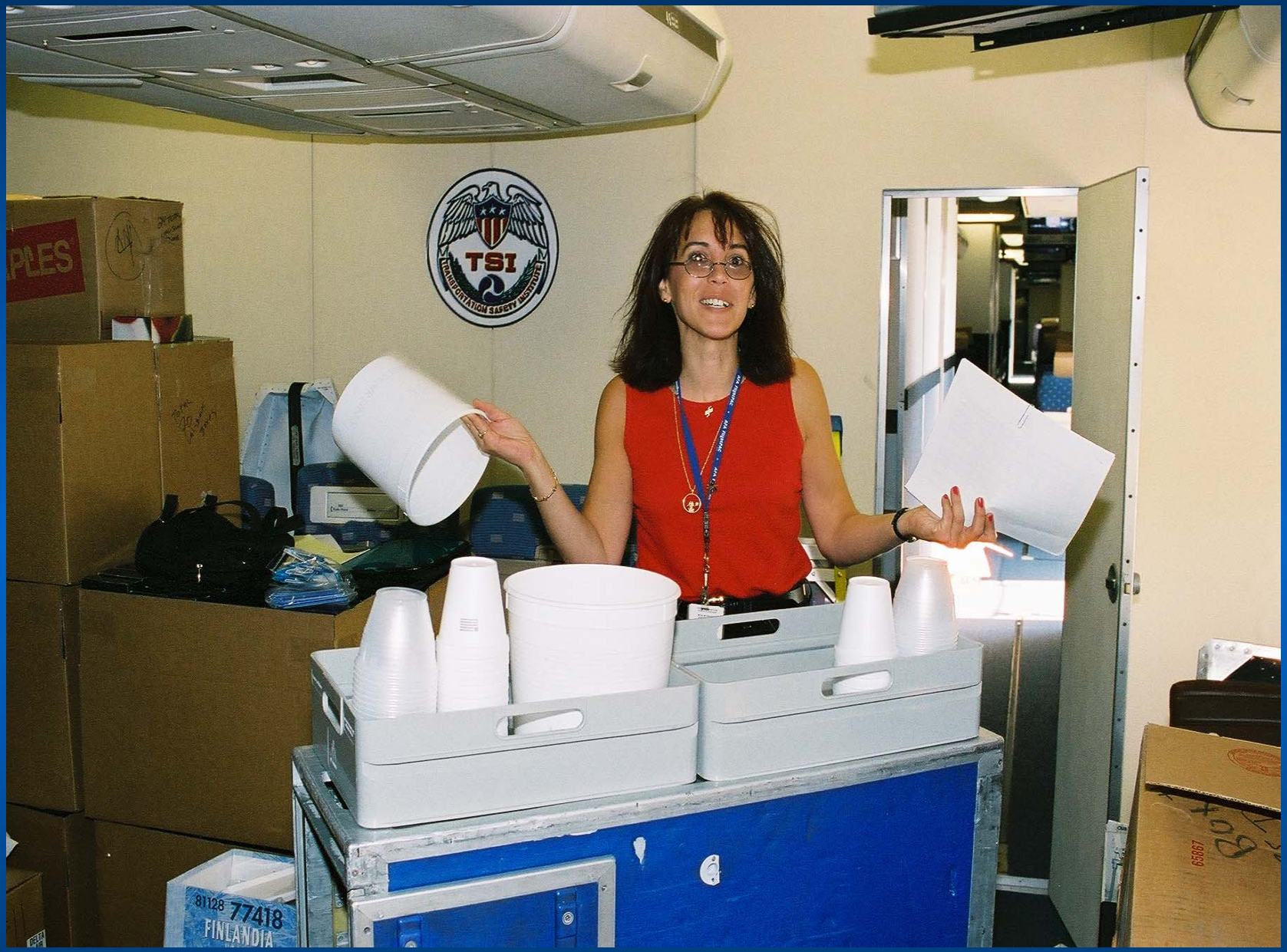
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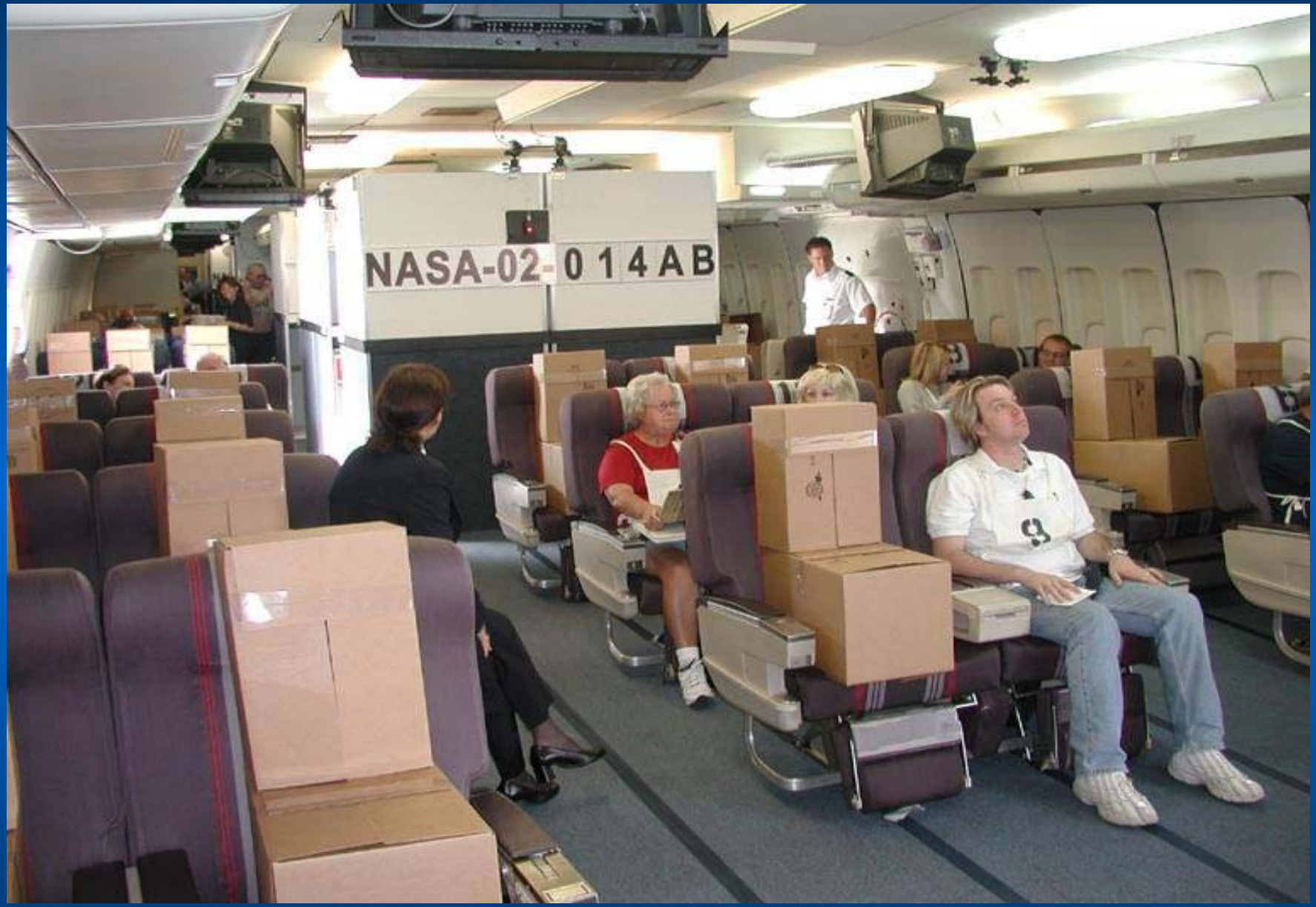
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ANALYSIS OF RESULTS

- Video Tape Recordings
- Flight Attendant Seating Times
- Passenger Seating Times

DATA

- Reduced and Compiled by Members of the FAA Civil Aerospace Medical Institute
- Overseen by Members of NASA

REPORT

Due out by the end of 2002


CAMI